

How much sulphur do cereal crops need?

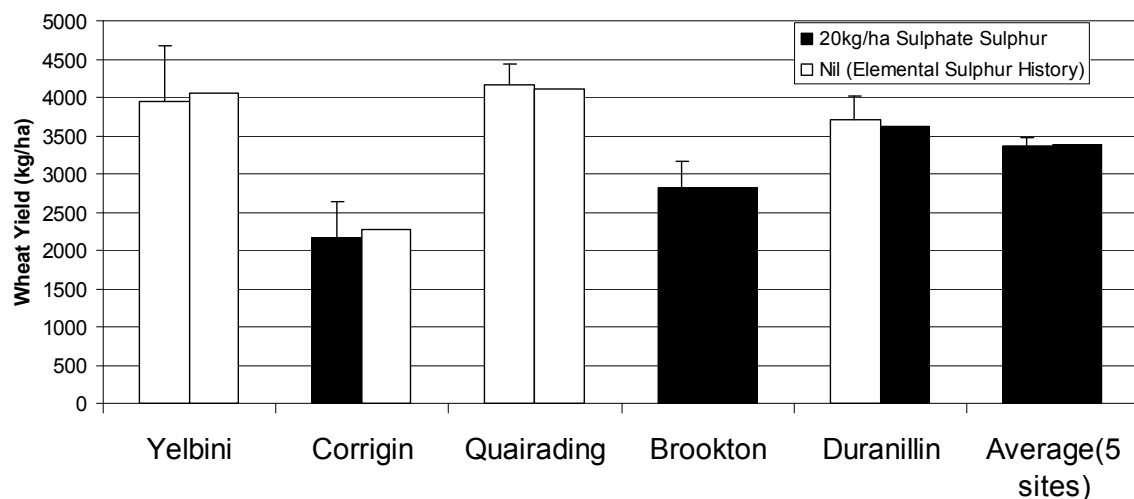
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Sulphur is an essential nutrient required for crops and pastures. Along with nitrogen, phosphorus and potassium, it is an essential plant nutrient. Among other functions, it is essential in the formation of protein.

To evaluate the effectiveness of an elemental sulphur history, Summit conducted 5 trials throughout the South-West agricultural region in 2003. Three replicates of 110kg Gypsum (sulphate S) and two replicates of Nil S (elemental S history) were spread immediately before sowing onto wheat. Growers that had a history of elemental sulphur (eg. MAPSZC®, DAPSZC®, Vigour®, Legume Special, Pasture) in their rotations were selected. Plots were 50m x 10m wide and were harvested via plot headers using 2 x 1.8 * 20 cuts. The Department of Agriculture's biometrics division conducted the statistical analysis.

The results showed that there were no yield advantages from applying an additional 20kg of sulphate S to wheat (Figure 1). This was generally consistent across a wide range of rainfall zones. These results suggest that residual sulphur from the Nil plots adequately met the requirements of the crops. This may be due to a combination of good background sulphur levels and *high residual S from the application of elemental sulphur in previous years*.

Figure 1. Wheat yield after Sulphate (as Gypsum) was applied at 5 sites with Elemental S histories (LSD 5%).



Sulphur is taken up from the soil in the form of sulphate. Most of the sulphur in soils is tied up in the soil organic matter and needs to be mineralised before plants can utilise it. Sandy soils within the high rainfall regions of WA usually have low organic matter levels and low CEC (Cation Ion Exchange) levels. Soils with low CEC's have a low capacity to absorb sulphate. As a result, sulphate, both mineralised and applied by sulphate fertilisers, can be leached

from the root zone. In the low rainfall regions, sulphur deficiencies can occur due to the low organic matter of the soils. In high rainfall regions, sulphur deficiencies can occur because the sulphur is leached from the root zone.

Sulphur actually falls from the sky! Sulphate occurs in rainfall from the ocean and the amount deposited can range from 1 to 10kg/ha – depending on the distance from the sea. There are two forms of sulphur fertilisers used in WA, sulphate and elemental. Sulphate fertiliser is immediately available to plants, but is subject to leaching. Elemental sulphur must be oxidised by soil microorganisms to produce sulphate, before plants can take it up. The rate of sulphate recovery from elemental sulphur depends on particle size, fertiliser granule properties, soil moisture and soil temperature. Research conducted by the Department of Agriculture has shown that elemental sulphur is an effective sulphur source for at least two years after application.

Sulphur is partially mobile in plants and therefore deficiency symptoms will first appear on new tissue. In cereals, deficient plants have a characteristic 'pale yellow' young leaf and in sub-clovers, leaflets are small and tend to fold and stand erect. Canola uses a large amount of sulphur and deficiencies are characterised by a reddening and cupping of the leaf margins. Sulphur removal is illustrated in Table 1.

Table 1. Sulphur removal in farm products

| Product | Sulphur Removed (kg/ha) |
|------------------------|--------------------------------|
| Hay (5 tonnes) | 7 |
| Grain (2 tonnes) | |
| Wheat | 4 |
| Barley | 4 |
| Oats | 5 |
| Lupins | 5 |
| Wool (5kg greasy) | 0.2 |
| Meat – 50kg liveweight | 0.4 |

More than 500mm of rainfall is needed before applied sulphate is leached from the top 10cm of soil. As a consequence of this, the residual value of applied sulphur in the low-med rainfall regions of WA would most likely be high.

Sulphur is an essential plant nutrient but a history of sulphur application, in particular [elemental sulphur application provides an excellent residual sulphur supply](#). The results from this trial work suggest that a history of elemental sulphur in the rotation will assist in reducing any yield penalties from sulphur deficiencies.